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Abstract

**CHEMICAL AND ELECTROCHEMICAL PROPERTIES OF TECHNETIUM
IN WATER SOLUTIONS**

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The paper deals with a problem of obtaining pure compounds of technetium from neutron-irradiated molybdenum metal and from the wastes of plutonium production, as well as with a study of chemical and electrochemical properties of technetium.

Technetium can be of a few valencies which easily pass from one to another; sometimes a solution can be even characterized by various states of technetium at a time, all this involves much difficulty when working with this element. Besides, it is necessary to take into consideration such properties of technetium as disproportionation, complex formation and hydrolysis.

Up to this day important problems of technetium chemistry have been those of obtaining its various oxidation states and investigation of their stabilization. Identification and analysis of technetium have involved some difficulties up till now owing to no data on absorption spectra characterizing each of its valent states in various media.

In our earlier investigations we studied an extraction of technetium from acid, alkaline and neutral media by some organic solvents and found that acetone, tributylphosphate and quinoline, which are most available solvents and are able to extract pertechnate-ion with a great distribution coefficient.

Of a special interest is a study of extracting pertechnate-anion by acetone in alkaline medium. Acetone extracts technetium with a high distribution factor (10^4) and allows radiochemically pure technetium to be obtained at the first stage of extracting. Acetone is used by us for obtaining technetium in laboratories.

The paper includes data on chemical and electrochemical properties of

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some of valent states of technetium received by polarography and spectrometry.

A study was made of polarographic recovery of pertechnetate-anion by means of a mercury drop electrode against various backgrounds - 1M solutions of KNO_3 , KCl , Na_2SO_4 , NaClO_4 , NH_4Cl in a wide range of alkalinity and acidity of solutions as well as in peroxide alkaline and neutral media against the background of KOH and NH_4OH . Diffusion and catalytic processes of electrical reduction of pertechnetate-anion in various media were established. Conditions for obtaining different valent states of technetium were found as well as possibility of making use of potential values in analytical chemistry of this element. Stability of oxidation states of technetium VII, VI, IV and metal in alkaline, acid and neutral media were studied.

An investigation of absorption properties of technetium was made with the aid of scarcely soluble precipitates-molybdates, tungstates and phosphates.

A study was made of electrolytic deposition of technetium from sulfurous acid, pH 2, and sulphate-ammonium, pH 5.6, solutions of pertechnetate-anion under constant cathode potentials of the platinum electrode used. On the ground of measuring the rates of electrodeposition of technetium the critical potentials of its deposition from these solutions were found. A calculation was also made of a standard potential of technetium oxide which, as to its magnitude, proved to be close to data published in literature.

It was established that electrodeposition of technetium, similar to rhenium, takes place under great overvoltage. Depositions formed on the cathode are not of a clearly crystalline character and their structure can be revealed after additional annealing. X-ray patterns of electrolytic deposits exhibit not only the lines of technetium metal but also the lines whose parameters should be apparently attributed to technetium in oxidation state. They are close to the parameters of the MnO_2 tetragonal lattice.

A presence of colour reactions of technetium with a number of organic substances provided for new methods of its determination by using extraction with the aid of acetone and subsequent photometry.